Exponent Laws

There are a few “shortcuts” we can take when performing operations involving numbers with a common base, but different exponents. The three exponent laws covered in this section are:

$\frac{x^a}{x^b} = x^{a-b}$	$(x^a)(x^b) = x^{a+b}$	$(x^a)^b = x^{ab}$
Division Rule	Multiplication Rule	Exponent Rule

Let’s look at a quick example of each to see exactly what these rules are saying.

Examples:

$\frac{5^6}{5^2} = 5^{6-2} = 5^4$. Since 5 is the “base” in the expression in the numerator **and** denominator, we can keep the same base and simply **subtract** the exponents to get our answer.

$(3^2)(3^7) = 3^{2+7}$. This is similar to the last example. We have a common base (namely 3), but this time, we’re multiplying the values. So, we keep the same base and **add** the exponents.

$(13^4)^5 = 13^{4\times5} = 13^{20}$. In this case, we have 13^4 all raised to the fifth power. Instead of multiplying out 13^4 and then raising it to the fifth power, we can take a shortcut and simply **multiply** the exponents.

Now, try these on your own:

1. $(2^3)(2^7)(2^2) =$

2. $\dfrac{(12^8)}{(12^4)} =$

3. $(6^2)(6^9) =$

4. $(3^6)(3^2)^2 =$

5. $((5^2)^3)^2 =$

6. $(3^5)(9) =$

(Hint: Try writing 9 as a power of 3)

7. $\dfrac{(5^2)(5^8)}{5^3} =$

8. $\dfrac{2^8}{4^3} =$

(Hint: Try writing 4 as a power of 2)

9. $\left(\frac{(15^{16})}{(15^{11})}\right)^{4} =$

10. $\frac{(5^{3})(4^{8})}{(4^{3})(5^{2})} =$

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